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No. 1253

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LIVESTOCK FEED PROCUREMENT

STRATEGY FOR FEED PRODUCTION

Moscow SEL'SKAYA ZHIZN' in Russian 13 Aug 80 p 2

[Article by A.B. Upsi, secretary of the Central Committee for the Communist Party of Estonia: "Strategy for Feed Production"]

[Text] During the Tenth Five-Year Plan, the average annual milk yield per cow in Estonia reached 3,500 kilograms. An increase took place in the number of large-horned cattle. There were 51 animals for every 100 hectares of agricultural land, including 19 cows producing in excess of 650 quintals of milk.

Seventy percent of all feed is being employed in dairy animal husbandry. During the wintering period and taking into account the high productivity of the herd, no less than 2,000 feed units are required for each nominal head. Such farms as the imeni Gagarin and Tartu sovkhozes and the Kungla and Lustivere kolkhozes in Yygevaskiy Rayon and the Paala Kolkhoz in Vil'yandiskiy Rayon have for several years in a row accumulated the required quantities of forage. The republic's farms on the average have still not achieved such a level.

The proportion of concentrates being used is increasing owing to a shortage of coarse feeds. However, rations having a high percentage of grain are best suited for pig farming. Using concentrates, the republic's pig farmers increased their production of pork by 17 percent over a period of 4 years during the five-year plan. On the other hand, no positive results were realized from the feeding of grain in dairy animal husbandry. Last year, milk production was 2.5 percent less than the figure for the first year of the five-year plan. This is a very alarming fact.

We discussed all of these problems in detail during the last plenum of the Central Committee of the Communist Party of Estonia. Measures were prepared for developing feed production during both this and subsequent years.

Grain serves as the foundation for the rations employed in both pig and poultry raising and thus priority importance is attached to grain production.

During the Tenth Five-Year Plan, the republic's gross yield of grain increased by 40 percent. This was achieved by means of an expansion in the growing areas and also by an increase in cropping power. Compared to the previous five-year plan, the plantings of early ripening varieties of barley increased by a factor of five. At the present time, barley occupies 26 percent of the areas set aside for grain crops. Intensive varieties are being introduced into production operations on an extensive scale; this year they will occupy more than one half of the areas on which grain is being grown.

Thus, much has been done in the interest of increasing grain production. However, one future task will be that of raising in every possible way the cropping power of a grain hectare. Opportunities are available for accomplishing this. First of all it will be necessary to achieve a sharp increase in the per hectare yields of grain on those farms where the yields are still lower than 20 quintals.

Permit me to cite such an example. Each year the Pylva and Rakhu kolkhozes in Pylvaskiy Rayon obtain more than 30 quintals of grain per hectare. Yet the Orava Sovkhoz in this same rayon is often content with obtaining only 10 quintals. Nor can any objective reasons for this difference occurring be cited. This is why, during a meeting of the Bureau of the Central Committee of the republic's Communist Party, we examined the problem concerned with the work being performed by the Pyarnuskiy Rayon Party Committee aimed at improving weak farms to the level of leading ones. The program developed within the rayon was approved and recommended for introduction in all of the rayons. One of its principal aims concerns measures aimed at increasing the cropping power of grain crops to 30-35 quintals per hectare on all of the farms. An overall program for the entire republic was outlined: during the next few years, to obtain no less than 1 ton of grain per capita.

Perennial grasses occupy almost 85 percent of the areas set aside for forage crops. They are used for preparing almost all of the summer feed for the livestock and also all of the hay, haylage, granules and briquettes. This is why such great importance is attached to grasses when preparing the feed production plans.

According to data supplied by our scientific research institutes, perennial grasses, assuming that they are correctly fertilized and properly tended, can furnish up to 100 quintals of hay or 5,000 feed units per hectare. Many of our farms are earnestly striving to achieve such yields. Even last year, an unfavorable one, the Kolkhoz imeni Tammsaare in Paydeskiy Rayon obtained an average of 63.6 quintals of hay per hectare, the Vambola Kolkhoz in Vil'yandiskiy Rayon -- 63.6 quintals and at the Olustvere Sovkhoz -- 69.1 quintals.

But the average cropping power for perennial grasses is almost two times lower than the figure which we require. This derives mainly from the fact that the perennial grasses are usually supplied with considerably less

mineral fertilizer than the amounts called for in the norms. We drew the conclusion that the mineral fertilizers must be redistributed. Scientists have established the fact that the mineral fertilizer norms being employed on some farms throughout the republic for potatoes are too high. This is resulting in a deterioration in the taste and marketable qualities of the tubers. Quite often, grain crops which were supplied with an excessive amount of nitrogen fertilizer lodge and thereafter suppress sown cover grasses. Such a phenomenon cannot be tolerated. Indeed, a shortage of nitrogen fertilizers is being experienced throughout the republic and thus they must be used in a thrifty manner. This can be accomplished by expanding the plantings of leguminous grasses. However, it is precisely the leguminous grass plantings, and primarily clovers, that have been reduced by almost 40 percent throughout the republic in recent years. There were reasons for this being done: the farms were looking for early ripening grass stands, with cereal grasses occupying a leading position among them. Certainly, the animals require green feed in May and yet, when defining the structure for the perennial grass plantings, one must not overlook the fact that the soil must be enriched and that clover can be of assistance in balancing a ration in terms of its protein content.

An equally important problem is that of the overall strategy for feed procurements -- what type of feed should be prepared from the grasses. During the past few years, considered to be unfavorable for feed production purposes, a considerable reduction -- by 25 percent -- occurred in hay procurements throughout the republic. On the other hand, an increase of almost threefold took place in the production of grass meal, granules and briquettes. Increases were also recorded in haylage and silage procurements. Certainly, there must be diverse types of feed and yet the experience of our better farms has shown that it is impossible to achieve high milk yields during the indoor maintenance period in the absence of high quality hay. This is why an average of 2 tons of high quality hay should be laid away per cow. Towards this end, the decision was made to store such hay in barns having forced ventilation, to rick and stack the bulk and to dry it on frame-rakes.

During the years of the Tenth Five-Year Plan, the capability of the feed procurement equipment on the farms increased by a factor of almost 1.5. But the requirements for transport equipment usually increase by a factor of 2.5 during the second and third quarters. The needed motor vehicles and tractors, in accordance with a decision handed down during the Plenum, will be obtained from the Goskomsel'khoztekhnika system, from land reclamation specialists and from other branches of the national economy. We have resolved to solve the transport problem using our own resources. The problem of ensuring the availability of a sufficient number of hay-tedders is somewhat more complicated. Under our conditions, the number of hay-tedders suitable for operations has decreased by one half over a period of 4 years. It is hoped that the Ministry of Tractor and Agricultural machine building will furnish us with assistance. At the same time, they have resolved to do something themselves. A unique design for rake-agitators

has been developed at the Estonian Scientific Research Institute of Farming and Land Reclamation. Their production has commenced at enterprises of Goskomsel'khoztekhnika.

One critical problem is the need for raising the quality of the feed being placed in storage for winter. The system for evaluating quality was developed years ago by the scientific research institutes. The use of laboratory methods for evaluating quality has been introduced into operations on a rather extensive scale. This work is being carried out by two republic laboratories and two farm laboratories. Checks were carried out last year on two thirds of the hay and haylage procured and on four fifths of the silage, granules and briquettes procured. This year, all of the feed will undergo laboratory evaluations.

The task confronting all farms consists of having 2,000 feed units for each nominal head of cattle during the stabling period. A strong foundation has already been established this year for carrying out this task: the grain crops are developing in a fine manner and the grasses are producing high yields.

The feed procurement work is proceeding in a successful manner. Considerably more hay has been procured than was the case last year. Not only many farms but even entire rayons such as Paydeskiy, Khiuumaaskiy, Raplaskiy, Khar'yuskiy and others have completely fulfilled their hay procurement plans. More than 90 percent of this feed has been adjudged to be of 1st or 2d class quality. The laying in of haylage and the production of other types of feed are proceeding according to schedule. A strong feed base will ensure the successful completion of the plans for the Tenth Five-Year Plan and create a fine stockpile for the future.

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FEED GRASSES USED TO INCREASE GLIADIN IN FEED

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 8, Aug 80 pp 96-103

[Article by G. Eykhfel'd, VASKhNIL academician and corresponding member of the USSR Academy of Sciences, R.I. Toomre, candidate of agricultural sciences, Estonian Scientific Research Institute of Farming and Reclamation and Kh. M. Older: "Feed Grasses for Solving the Protein Problem"]

[Text] During a speech delivered before the Plenum of the CPSU Central Committee on 27 November 1979, Comrade L.I. Brezhnev focused attention on the need for achieving a rapid solution to the protein problem in animal husbandry. An increase in the production of livestock products based upon the existing numbers of livestock and amounts of feed is dependent to a considerable degree upon such a solution being realized.

A protein shortage in feed supplies has been observed in the Soviet Union for several years now and in recent years this shortage has even increased somewhat, since the requirements for feed protein have increased as the productivity of the animals has increased. In the decisions handed down during the July (1978) and November (1978) plenums of the CPSU Central Committee, emphasis was placed upon the need for raising the productivity of cows and the task was assigned of raising the average annual milk yield to at least 3,000 kilograms per cow during the next few years and in regions where such a level has already been achieved -- to 4,000-5,000 kilograms. Thus the protein requirements are expected to increase even more during the next few years.

During the course of searching for solutions to the protein problem, the opinion was expressed that industrially produced protein will play a decisive role in the future. But in connection with the development and intensification of the energy crisis, it has become clear that the cost of protein created in this manner will exceed by several times the cost of plant protein, in those instances where large quantities of nitrogen fertilizers are required in order to obtain the former. Thus the conclusion was once again drawn that the principal means for solving the problem consists of increasing the production of plant bulk, mainly through the

intensive cultivation of perennial grasses and improvements in the methods employed for utilizing them and for preserving their nutritional value.

In this regard, during the past decade throughout the world and especially in those countries engaging in intensive cattle husbandry, the role played by grasses has increased considerably. This has come about owing to the extensive area of their cultivation, their ability to utilize effectively large quantities of mineral fertilizers and to furnish high yields even when they are employed in an intensive manner -- in northern regions up to 150 and in southern regions up to 250 quintals per hectare of dry substance, containing up to 30 percent crude protein. No other forage crop, not even soybeans, can compete with them in terms of protein yield per unit of space.

Based upon the fact that the nutrient concentration in grass feeds can be raised by improving the methods employed for cultivating and procuring them, as a result of which their energy value approaches that for grain, and also taking into account their high protein content and low cost, the grasses being grown in many countries engaging in intensive animal husbandry have become the principal form of livestock feed. Thus, during the past few years in the U.S.A., Canada, Great Britain, the GDR and other countries, they have constituted 55-70 percent of the ration for large-horned cattle, while at the same time the proportion of concentrates has not exceeded 25 percent. The milk yields in these countries fluctuate between 4,000 and 5,200 kilograms.

In the Soviet Union, where according to statistical data the proportion of large-horned cattle in the public sector amounted to 67 percent (66.4 million livestock units in all) in 1979 and where in 1977 the area employed for perennially sown grasses equalled 26.1 million hectares, annual grasses -- 15.8 million hectares and natural meadow-pasture lands -- 375 million hectares [1], the proportion of grass feed in the ration for large-horned cattle decreased during the past decade and that of concentrates, that is, grain, decreased, having reached an average of roughly 30 percent for the country as a whole and in some republics and oblasts even 40 percent. Thus, in 1978 in the Estonian SSR, where the average milk yield per cow was only 3,475 kilograms, the proportion of concentrates in the livestock ration was increased to 42-44 percent. At the same time, there are farms in the republic having milk yields in excess of 5,000 kilograms and a concentrate percentage in the ration for cows of no more than 30 percent. For example, in 1978, at the Kolkhoz imeni 9 May in Paydeskiy Rayon, an average milk yiel' of 5,170 kilograms per cow was obtained under such conditions from 1,345 cows.

Estimates have shown that, for the present average milk yield level and assuming the proper conduct of feed production operations, the proportion of concentrates in the ration for large-horned cattle must not exceed 20 percent. Recently, we have been feeding 25-30 million more tons of grain annually to our large-horned cattle than the amount required for correct feeding operations. When one considers that 35-37 million tons of grain alone are being utilized for feed purposes annually [1], then it becomes

readily apparent that great economy can be realized in the use of this valuable product, even in the face of an increase in the amount of livestock output, by raising the proportion of grass feed in the ration for large-horned cattle.

The task of increasing the production of grass feeds is also discussed in a decree of the CPSU Central Committee and the USSR, adopted in March 1980.

Such feeds are required in particular in the nonchernozem zone of the Soviet Union, where the weather conditions are generally unfavorable for the growing of other high protein crops (for example, soybeans) but favorable for the cultivation of grasses.

The task of supplying animal husbandry with grass feeds in regions where there is intensive cattle husbandry, that is, where there are 50 head of large-horned cattle for every 100 hectares of cultivated land, can be realized only if meadow culture operations are well organized. The results of numerous experiments and also production experience have shown that grasses furnish stable and high yields of feed units and protein in the nonchernozem zone, yields which exceed those being obtained from all other crops. Thus, during experiments conducted by the Estonian Scientific Research Institute of Farming and Reclamation, for different periods of grass utilization (up to 26 years), annual averages of 50-135 quintals of absolute dry substance per hectare and 6-18 quintals of protein per hectare were obtained. On sod-gleyed soil of the Kuuziku Experimental Base (Estonian Scientific Research Institute of Farming and Reclamation), with surface improvements to the natural haying land but with no renovation of the grass stand for more than 20 years (1959-1979), annual averages of 62.6 quintals of dry substance and 6.72 quintals of crude protein were obtained per hectare against a background of $N_{60}P_{90}K_{120}$ and two cuttings and against a background of $N_{300}P_{90}K_{120}$ and on the average for 15 years -- 76.2 and 14.5 quintals per hectare respectively. Moreover, during all of the years in which the experiments were conducted the yield of dry substance was never lower than 50 quintals per hectare.

During production experiments carried out on rocky and dry soddy-calcareous soil at the Kar'ya Experimental Station and at a model-research sovkhoz of EstNIIZiM [Estonian Scientific Research Institute of Farming and Reclamation], sowings of a local form of sickle-shaped alfalfa produced an average yield of 40.2 quintals of feed units per hectare during 26 years of use of a cultivated pasture and from a meadow plot -- 74.7 quintals of hay per hectare or 33.9 quintals of feed units per hectare. At the Kar'ya Model-Research Sovkhoz, on 150 hectares of cultivated pastures consisting of shallow soddy-calcareous soil, annual yields amounting to an average of 33.1 quintals of feed units per hectare were obtained during the past 10 years, whereas the productivity of barley on this same variety of soil and during this same period of time did not exceed 10-20 quintals of feed units per hectare (including straw). During experiments in intensive meadow culture, carried out at EstNIIZiM on soddy-gley soil, the average yields, depending upon the quantity of nitrogen fertilizer ($N_{100,300}$) applied and the type of

grass involved, amounted to 68-135 quintals of absolute dry substance per hectare and 8.6-13.5 quintals of crude protein per hectare when multiple cuttings (2-4) were obtained (see Tables 1 and 2).

The fact that grasses, when cultivated correctly and assuming further intensification of feed production operations, can produce higher yields of feed units and protein than grain crops is borne out by computations carried out for the Estonian SSR, where during the past few years the crop husbandry level has been one of the highest for the union republics. Thus, during the 1974-1978 period the average grain yield here amounted to 21.1 quintals of feed units per hectare and 1.56 quintals of digestible protein, whereas the yield for perennially sown grasses -- 22.2 and 2.22 quintals per hectare respectively. During experiments conducted by EstNIIZiM under intensive cultivation conditions on five different soils, the average grain yield for 4 years was 29.5 quintals of feed units per hectare and digestible protein -- 1.94 quintals per hectare, whereas the grass yields under the same conditions equalled 31.7 and 3.17 quintals per hectare respectively.

In the near future, with the plans in many zones of the Soviet Union calling for the average grain yield to be raised to 30 quintals per hectare (in granary weight), sown perennial grasses -- to 50 quintals of absolute dry substance per hectare with a protein content of 13-14 percent, potatoes -- to 200 quintals per hectare and the remaining succulent and green feeds -- to 300-400 quintals per hectare, a portion should be allocated for animal husbandry from each hectare of sowing area (minus the seed):

grain crops together with straw	33.0 quintals of feed units, 3.8 quintals of protein
sown perennial grasses	37.7 quintals of feed units, 6.9 quintals of protein
potatoes	37.0 quintals of feed units, 2.3 quintals of protein
mistures of grain and pulse crops	33.7 quintals of feed units, 4.7 quintals of protein
food roots	39.0 quintals of feed units, 4.4 quintals of protein
field kale	33.5 quintals of feed units, 7.2 quintals of protein

Although each of the forage crops fulfills its role in the feeding of animals, they are nevertheless interchangeable on a broad scale in the ration for large-horned cattle. In solving the protein problem, consideration must be given to the fact that grasses make it possible to produce 2-3 times more protein per unit of space than grain crops or potatoes. Nor can the cost of the feed be ignored, especially in view of the fact that such costs have increased noticeably in all areas during the past few years. According to statistical data for the 1970-1978 period, the cost for 1 feed unit of grain in the Estonian SSR increased by 42-43 percent, green feeds -- by 109-166 percent, hay of sown grasses -- by 22-28 percent and potatoes -- by 222-251 percent. Moreover, the production cost for grass feeds remains two times lower than that for grain crops and five times lower than that for potatoes.

TABLE 1

Yield of Dry Substance and Protein (quintals per hectare) Depending Upon the Time of the First Cutting on the Average for 3 Years Use of a Feed Field

(1) Вид	(2) Сухое вещество						(3) Белок					
	N 100			N 200			N 100			N 200		
	а	к	%*	а	к	%*	а	к	%*	а	к	%*
(4) Лисохвост луговой	59.4	59.0	110.5	63.8	64.3	101.1	7.9	7.5	75.1	13.6	10.5	77.1
(5) Тимофеевка луговая	68.8	71.1	116.9	91.7	109.1	115.8	5.9	8.6	87.8	17.6	14.8	84.4
(6) Овсяница луговая	49.9	67.9	138.5	65.5	86.6	132.2	6.5	5.6	65.8	10.8	9.7	89.7
(7) Овсяница луговая	58.1	66.9	117.5	78.6	95.6	122.5	6.8	7.0	69.9	11.5	11.4	97.6
(8) Костер безостый	44.6	61.7	189.5	73.5	110.9	150.9	7.8	7.9	101.0	15.6	12.8	82.8
(9) Двукисточник тростниковидный	52.1	99.7	191.0	71.9	135.6	178.7	8.9	8.8	100	16.0	17.8	101.7

(10) Примечание: к -- при кущении, ц -- при цветении; * % от содержания в фазу кущения (к - 100%)

Key:

1. Type
2. Dry substance
3. Protein
4. Meadow foxtail
5. Cock's-foot
6. Timothy grass
7. Meadow fescue
8. Awnless brome grass
9. Reed canary grass
10. Note: k -- during tillering, ц -- during blossoming; *% of content during tillering phase (k - 100%)

TABLE 2

Yield of Absolute Dry Substance and Protein From Clovers and Clover Mixtures With Timothy Grass (quintals per hectare) Depending Upon the Time of the First Cutting

Травостой (1)	(2) сухое вещество					(4) белок				
	б	ц	%**	доля отавы в урожае (%) (3) б	ц	б	ц	%**	доля отавы в урожае (%) (3) б	ц
(5) Раннеспелый красный клевер	86.4	79.7	81.8	34.2	43.6	12.6	11.0	87.3	51.6	49.2
Позднеспелый красный клевер*	96.3	88.8	94.2	58.8	61.0	15.6	13.5	90.0	51.3	45.9
То же	68.0	87.6	146.0	25.8	19.1	8.6	11.5	133.7	34.9	23.7
(6) Розовый клевер	73.4	76.9	102.4	52.6	35.8	12.4	13.0	104.8	58.1	41.5
(7) Раннеспелый красный клевер с тимофеевкой луговой	78.0	107.6	152.4	38.4	20.3	11.1	11.7	100.9	47.7	27.5
(10) Позднеспелый красный клевер с тимофеевкой луговой	74.2	98.9	140.1	39.1	27.3	11.0	10.3	93.6	43.6	31.1

(11) Примечание: б - при бутонизации, ц - при цветении.
* в неблагоприятный для отрастания отавы год
** % от содержания в фазу бутонизации (б-100 %)

Key:

1. Stand of grass
2. Dry substance
3. Portion of aftergrowth in yield (%)
4. Protein
5. Early ripening red clover
6. Late ripening red clover
7. Ibid
8. Alsike clover
9. Early ripening red clover with timothy grass
10. Late ripening red clover with timothy grass
11. Note: б -- during budding; ц -- during blossoming; * a year deemed unfavorable for aftergrowth; ** % of content during budding phase (б-100 %).

Although grasses are distinguished by higher cropping power and despite the fact that they make it possible to supply animal husbandry with greater quantities of feed units and protein than the remaining forage crops, their productivity and especially their protein yield and digestibility are dependent to a considerable degree upon the developmental phase of the plants during harvesting and upon the intensity of fertilization. Thus one feed unit of grass feed may contain from 0.9 to 2.4 kilograms of absolute dry substance. The protein content in the remaining forage crops fluctuates only within the limits of several tens of percent, whereas in the case of cereal grasses the difference can be fivefold. According to data obtained from studies carried out at EstNIIZiM, the amount of protein in the dry substance of cereal grasses, depending upon the type and intensity of fertilization, decreases by 3.7-4.8 times -- from 26.5 to 6.9 percent -- when the first cutting is carried out during the tillering-stem extension phase of the plants or during blossoming and crude protein by 4.5 times -- from 21.5 to 4.5 percent (see Table 3). Although the gross yield of dry substance from a first cutting of cereal grasses, carried out during the tillering phase, was 10.5-91 percent lower than that carried out during the blossoming period (see Table 1), the protein yield was either the same or, in the case of an earlier cutting time, higher -- up to 34 percent. But the amount of digestible protein for all types of grasses, in those instances where the first cutting was delayed until blossoming, decreased by 30-42 percent.

The reduction in protein content in cereal grasses can be considerable in the case of a first cutting, since it can be carried out during the various phases of plant development -- from tillering to the commencement of fruit bearing. The aftergrowth is usually utilized during the early phases of plant development -- from tillering to heading and thus the protein content in a yield obtained from later cuttings is close to the first cutting in terms of this indicator, with the first cutting having been carried out during the tillering-heading phase. Moreover, the amount of protein in aftergrowth is still dependent upon the dosage of nitrogen applied following the first cutting.

A yield of no lower than 40 quintals of absolute dry substance per hectare can be considered satisfactory for the intensive cultivation of grasses in the nonchernozem zone. Depending upon the soil type, 100-150 kilograms of nitrogen must be applied per hectare in order to obtain such a yield from a cereal grass stand. Leguminous grasses and also leguminous-cereal grass mixtures furnish the same amount of dry substance in the absence of nitrogen fertilization.

Thus it is far more simple to produce protein rich grass feeds using leguminous grasses. Moreover, the protein content in cereal grasses decreases by almost five times as the plants become older and in the case of leguminous grasses -- by only 10-12 percent (see Table 4).

Taking this into account, we believe that no less than 45-50 percent of the overall area used for sown perennial grasses should be occupied by

leguminous grasses in Estonia. On the one hand, this will make greater quantities of nitrogen fertilizer available for cereal grasses and raise the cropping power of these grasses and, on the other hand, it will promote an increase in the production of plant protein throughout the country as a whole. According to data supplied by Ye.N. Mishustin, pulse crops provide 27 percent of the plant protein produced in the Soviet Union and in the U.S.A. -- 47 percent.

When determining the optimum proportion of grass feeds in the ration for large horned cattle, it must be borne in mind that in accordance with the zootechnical requirements coarse feed must constitute no less than 45 percent of the ration and this applies to the rations for highly productive cows having annual milk yields in excess of 5,000 kilograms. Moreover, in order to ensure milk yields in excess of 3,500 kilograms this requirement for coarse feeds must be covered entirely by high quality grass feeds. In the case of lower milk yields and when raising young stock, it is possible, based upon the zootechnical requirements and economic computations, to raise the proportion of coarse feeds in a ration to 70-80 percent, with no less than 60 percent being grass feeds.

In order to obtain a milk yield of 3,500 kilograms, 2-2.4 tons of dry substance from grass feeds must be procured for the winter for each cow, for each head of young stock -- 2 tons and for the summer period -- 1-1.2 and 1 ton respectively, for a 13-14 percent protein content in the absolutely dry substance.

No difficulties are involved in obtaining green feed having such a protein content during the summer, since pasture grass and distributed fodder, even when utilized correctly to only a slight degree, always contain no less than 14 percent protein in absolutely dry substance. But it is possible to ensure such nutritional value in grass feeds procured for the winter only in those instances where the first cutting is carried out during the early phases of grass development -- during the period from tillering to the commencement of blossoming, that is, with multi-cutting usage.

The formation of a grass crop is dependent to a substantial degree upon the height of the cut. In production operations this usually amounts to 10-20 centimeters above the surface of the ground, but existing equipment makes it possible to cut to a lower height of 5-6 centimeters. Studies carried out in Estonia during the past few years have shown that a cutting height of 10-20 centimeters leaves 20-40 percent of a crop unharvested. A necessary condition for converting over to a lower cutting height is that of levelling off the soil's surface prior to planting the meadow and pasture lands and also spring packing of the grass stands.

An increase in the proportion of grass feeds in the ration for large-horned cattle, at least to 50 percent, will make it possible to cover approximately 65 percent of the protein requirements of the animals and it will serve as a prerequisite for quickly raising the milk yields and also for reducing the

TABLE 3

Protein Content in Absolutely Dry Substance of Cereal Grasses From a First Cutting, Depending Upon the Phases of Plant Development (in %)

Вид (1)	(2) Белок						(3) Переваримый белок					
	N 100			N 300			N 100			N 300		
	к	ц	%*	к	ц	%*	к	ц	%*	к	ц	%*
(4) Лисохвост луговой	27.8	12.4	53.5	23.3	19.4	83.5	16.2	7.1	43.8	16.5	10.9	65.9
(5) Ежа сборная	23.4	10.6	45.5	24.8	10.6	42.6	18.8	5.2	31.0	17.8	5.2	29.1
(6) Тимофеевка луговая	17.6	6.9	39.6	19.5	9.2	47.3	13.1	3.7	28.0	14.6	4.9	33.4
(7) Овсяница луговая	21.1	10.4	49.4	25.1	11.4	45.5	16.0	6.5	39.4	19.0	6.0	31.9
(8) Костер безостый	17.6	9.5	53.9	21.2	11.6	54.4						
(9) Двукисточник тростниковидный	28.6	8.7	33.8	29.5	10.8	36.6	18.7	4.6	24.1	21.5	5.6	26.2

(10) Примечание: к - во время кущения, ц - во время цветения, * % - от содержания белка во время кущения (к-100 %).

Key:

1. Type
2. Protein
3. Digestible protein
4. Meadow foxtail
5. Cock's-foot
6. Timothy grass
7. Meadow fescue
8. Awnless brome grass
9. Reed canary grass
10. Note: k -- during tillering; ц -- during blossoming; * % -- of protein content during tillering (k - 100%).

TABLE 4

Protein Content in Absolutely Dry Substance of Various Types of Clover
(quintals per hectare)

Вид (1)	(2) Первый укос			(3) Второй укос — дней после первого					
				10		36		72	
	б	ц	%*	б	ц	б	ц	б	ц
(4) Раннеспелый красный	15.2	14.3	93.5	24.9	22.6	18.0	17.1	14.0	18.2
(5) Позднеспелый красный	15.7	14.0	89.7	23.6	17.0	15.7	15.4	16.1	14.9
(6) Розовый	14.7	15.4	104.8	24.9	24.5	17.7	19.3	18.0	—

(7) Примечание. б- при бутонизации, ц- при цветении; * % от содержания белка при бутонизации (б-100 %).

1. Type
2. First cutting
3. Second cutting -- days following first cutting
4. Early ripening red clover
5. Late ripening red clover
6. Alsike clover
7. Note: б -- during budding; ц -- during blossoming; * % of protein content during budding (б - 100%).

use of concentrates, that is, grain (to 20 percent on the average for the Soviet Union). This will make it possible to use tens of millions of tons of grain for other purposes, primarily for the production of pork and poultry meat. At the same time, decisive improvements will be realized in the health of the large-horned cattle and the profitability of animal husbandry will be raised.

In order to increase the production of grass feeds, solutions must be found for several tasks without delay. First of all, grass seed production operations must be organized, especially for leguminous grasses -- clovers and alfalfa. The technical base for meadow culture is in radical need of improvement. The farms must be supplied with wide-cut mowing machines, since the mown area will be increased by 2-2.5 times with the conversion over to multiple cuttings of the grasses. The task of supplying the farms with grass seed drills has already been under discussion for more than 20 years and as yet with no positive results. High quality grass feeds require appropriate conditions for storage. A considerable increase must take place in the size of ventilated barns used for hay storage, barns which meet the modern requirements for silage trenches. The farms must also be supplied with the required amounts of preservatives and synthetic films.

Conclusions

In the nonchernozem zone, grasses furnish stable and high yields in both feed units and protein, thus exceeding to a considerable degree other forage crops in terms of these indicators. Thus they must occupy a leading place here with regard to strengthening the feed base and solving the protein problem. Grasses make it possible to produce 2-3 times more protein per unit of space than grain crops or potatoes. Moreover, their production cost is two times lower than that for grain crops and five times lower than that for potatoes. In this regard and considering the present average milk yield level (3,500 kilograms), the proportion of concentrates in the ration for large-horned cattle must not exceed 20 percent while at the same time coarse feeds must constitute 70-80 percent, with no less than 60 percent being high quality grass feeds. This will make it possible to cover approximately 65 percent of the livestock protein requirements and it will result in a considerable reduction in the use of grain, which can then be used for the production of pork, poultry meat and for other purposes.

The productivity of grasses and especially the protein yield, and also its digestibility, are dependent to a considerable degree upon the developmental phase of the plants during the harvesting and upon the fertilizer dosages applied.

In order to obtain a yield on the order of 40 quintals of dry substance per hectare from a cereal grass stand, 100-150 kilograms of nitrogen must be applied per hectare depending upon the type of soil. Leguminous grasses and leguminous-cereal grass mixtures furnish identical quantities of dry

substance with no nitrogen fertilizers being employed. Thus, no less than 45-50 percent of the overall area for all sown perennial grasses should be used for cultivating these grasses and mixtures.

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FEED PRESERVATION WHILE MAINTAINING QUALITY

Moscow SEL'SKAYA ZHIZN' in Russian 22 Jul 80 p 2

[Article by S. Zafren, doctor of agricultural sciences, professor; V. Lesnitskiy, candidate of agricultural sciences: "Let's Not Deceive Ourselves"]

[Text] Recently, several farms have been introducing a modernized technology for harvesting gramineous crops. Freshly-cut crops are dried in windrows to 20-25 percent moisture content, and sometimes less, harvested by combine-choppers, transported to storage trenches, packed down firmly by heavy tractors, and covered with sheeting. What is this but the processing of haylage? But, why then was it necessary to sun-dry the grass crops to 25 percent moisture content? It is, in fact, well known that the fewest overall losses(in the field and the trench) of nutrients occur when grasses are sun-dried to 50-55 percent moisture content. The drying out process, in clover for example, when carried only as far as the 40 percent level, causes the loss of a quarter of all nutrients. With further drying, the losses increase proportionally--the farther the drying proceeds, the heavier the loss will be.

One of the advantages of haylage processing over hay storage is the fact that this method permits collection of the dried crop at 50-55 percent moisture content when losses do not exceed six to eight percent. Sun-drying of gramineous crops below the 50 percent moisture level requires that such crops remain in the field for extended periods, increasing the risk of their exposure to rainfall and of subsequent greater losses. In addition, such sun-drying leads to appreciable heat buildup within masses of hay piled in trenches, and even more so in piles covered with sheeting. This practice almost completely destroys carotene, drastically reduces protein quality, and lowers the overall nutritive value of feeds. While the nutritional useability of protein in properly processed haylage totals 70-75 percent, it drops to 25-30 percent as a result of massive heat buildup.

For the unwary, feed produced by these means creates a false impression: it has a pleasing aroma, indeed, cattle quite readily consume it. But, alas, high milk yields will not obtain from its use. Many farms have learned this through unhappy personal experience. There is, therefore, not a single basis upon which the useful promulgation of such a method of processing gramineous crops can be recognized.

Unfortunately, far from all sovkhozes and kolkhozes keep within the optimal parameters for sun-drying of grasses into haylage. On some farms, the crop is overdried, while on others(more often the case), it is underdried. Careful analysis has shown that the moisture content of feed put into short-term storage as haylage very often reaches 70 percent and more. At this point, it is no longer haylage, but silage.

Can it be that the specialists who are using and promoting these methods are not aware that there is a distinction between haylage and hay? No, of course they are aware of this. Evidently, the crux of the problem lies elsewhere: of more than passing importance is the category under which feed is entered in the accounting records. The fact is, one kilogram of hay contains 0.45-0.50 feed units, while one kilogram of haylage contains 0.35--0.40, and one kilogram of silage, only 0.2 feed units. And, transforming silage to haylage, and haylage to hay, with a single stroke, "increases" by a factor of 1.5 available feed reserves. It is understandable that accounting records in which haylage quality is indicated by a moisture content of 70-75 percent, while its nutritive value is listed as equal to 35-40 feed units per quintal, would lead to an overestimate of amount of forage crop reserves, as well as to errors in computing the feed balance and livestock feed allotments.

Inasmuch as the use of "haylage" having 70 percent or greater moisture content has attained rather broad dimensions, some specialists are proposing that the acceptable nutritive value of a quintal of haylage for accounting purposes be lowered to 25 feed units. This, of course, would not be a solution to the problem. What is called for is the processing of haylage to the moisture level stipulated in official recommendations. If gramineous crops must be stored at a higher moisture level, then their nutritive value must be recorded in a way which reflects the actual dry-matter content.

Haylage processing has been rightfully recognized as a more progressive means for the preservation of grass crops, especially perennial grasses, as compared with processing either as silage or as hay. Losses of dry matter food value during haylage processing do not exceed 15 percent, as opposed to 20-25 percent for silage processing, and 25-35 percent and more for haymaking. An important point is the fact that perennial grass crops can and should be harvested for haylage during the stalk-setting stage; leguminous crops--at the start of the flower-budding stage. For this very reason, the dry-matter food value of haylage is higher than that of hay. During the later stages of growth, cellulose builds up in the plants and the content of protein and other nutrients declines.

There is still another factor causing similar juggling of the feed categories. Since haylage processing has become the foremost method for preserving gramineous crops, the more of them turned to feed by this method, the better. But, farms have separate quotas for the processing of hay, haylage, and silage. In harvesting more grasses for haylage than called for by the plan, but failing to achieve projected figures for hay or silage, a farm

will be listed as not having met plan requirements for feed production. This may be the reason that some farms, while processing silage, prefer to categorize it as haylage, and likewise to record haylage as hay. This practice muddles accounting records, increases losses during feed processing, and, in the final analysis, damages livestock production.

The agricultural sector has available to it a considerable variety of means for the preservation of fresh green feeds. But, this does not in any sense mean that all of these means must be employed by every farm, nor that any farm is obliged to obtain each year the greatest possible amount of "preserves" from their gramineous crops. It is well known, for example, that hay can, in many cases, be successfully replaced, not only by haylage, but by silage from grasses as well. It is better to have good haylage than poor hay, good silage than poor haylage. This, of course, does not mean that it is not necessary to be concerned about the hay crop. Hay from virgin farmland is beyond comparison less costly than haylage and requires less complex transportation technology to deliver it to feedlots.

From the various means of feed preservation, a farm must select the one which is most appropriate for its specific situation with regard to weather and other relevant conditions, and thereby better preserve the harvest and obtain high-quality feed at the lowest cost.

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FEED PRESERVATION IN BELORUSSIA

Minsk SEL'SKAYA GAZETA in Russian 29 Jul 80 p 2

[Article by V. Antonyuk, director of the Belorussian NII for Animal Husbandry; O. Verbich, candidate of biological sciences; Ye. Borisenko, candidate of agricultural sciences: "If There Are No Preservatives..."]

[Text] Adverse weather conditions, accompanied by unrelenting rainfall during hay making operations, are one reason for yields of poor-quality feeds on a number of farms. Particularly with regard to hay and haylage. It is also difficult to produce good-quality silage from a rain-soaked crop. It is essential, therefore, to be able to select and directly apply techniques for processing forage crops consistent with complex weather conditions and the technical capabilities of agriculture.

The importance of this is shown by the following example. Hay left to dry in the field during rainy weather sustains losses in feed units and useable protein of up to 50-60 percent, while carotene losses are on the order of 90-95 percent, that is, one kilogram of this hay will contain only 1.5-2 milligrams of carotene(as opposed to a norm of 25-30). Its nutritive value will be essentially the same as that of straw.

Because of weather conditions, the stacks of new-mown hay awaiting processing into haylage cannot be brought to a moisture level of 55-60 percent within one to two days. This situation initiates a rapid breakdown of the most important nutritive substances--carbohydrates, proteins, and vitamins. As a result, the haylage thus produced has a rather low nutritive value. It would therefore be advisable to utilize this mown hay to produce sun-dried silage with a 65-70 percent moisture content. This moisture level can be obtained after five to six hours of sun-drying.

Conditions which, for the most part, prevent sun-drying of mown hay also frequently add to the problem. In order to avoid losses due to decomposition, it then becomes necessary to put the hay into silage in a freshly cut condition. It is important to bear in mind that this practice promotes the activation of butyric fermentation and putrefactive bacteria within the rain-soaked mass of moist hay. Especially harmful effects are observed

when heavy rains fall on freshly-cut hay stored in large open containers. This causes the silage to take on a greenish-black color, a greasy consistency, and a sharp, unpleasant odor, that is, it becomes practically unsuitable for livestock feed. In order to circumvent such losses, large masses of hay under long-term storage should be covered with plastic film during rainy periods.

One of the most effective means of maintaining gramineous crops as silage during rainy weather is the use of chemical preservatives. Experiments have shown that the addition of six to eight kilograms of sodium bisulfate to one ton of rain-wetted silage material permits feed yields containing as little as 0.29 percent butyric acid. The same silage without preservatives will contain 1.47 percent butyric acid, or five times as much. Benzoic acid, applied at the rate of two kilograms per ton, when used to preserve a rain-wetted, sun-dried grass-clover mixture, can provide feed yields free of butyric acid which meet first-grade requirements. The organic acids (formic, propionic, and acetic), as well as their compounds--applied at the rate of four to five liters per ton--are also excellent preservatives.

For these reasons, every farm should maintain a supply of chemical preservatives to be used primarily for laying-in stores of high-quality feeds in difficult weather conditions. Unfortunately, the kolkhozes and sovkhozes of the republic are presently receiving inadequate supplies of these preservatives. On some farms, they are lacking altogether. In such cases, such readily available chemical additives as sodium chloride and monocalcium phosphate may be used. These substances, though weaker in their preservative effect than, for example, the organic acids or sodium pyrosulfite, possess antiputrefactive properties in sufficient quantity.

The use of sodium chloride for preserving feeds has been practiced for a long time. In order for its preservative properties to be manifested, however, it must be applied in amounts exceeding 10 kilograms per ton. But, such an amount may turn out to be excessive for livestock. Gramineous crops therefore require a combined application of sodium chloride and monocalcium phosphate to avoid undesireable consequences. In this case, a mixture composed of five kilograms sodium chloride and one kilogram monocalcium phosphate in dry form is applied per ton of gramineous or gramineous-leguminous silage material.

The dry mixture must be applied to the silage evenly and in layers. As soon as possible, it should be packed down and tightly sealed, as is done during normal silage preparation.

It is very important that safety rules for applying these additives be strictly observed. Special instructions must be followed to the letter.

When gramineous crops which are excessively wet are stored in trenches, a considerable part of their nutrients is lost along with cellular fluid. The effectiveness of chemical preservatives is then not fully realized. A quantity of milled straw equal to 10-15 percent of the wet weight must therefore be added to gramineous silage in wet weather to reduce fluid loss and the overall moisture content of the silage material.

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HARVESTING OF GRAIN CROPS UNDER DIFFICULT CONDITIONS

Moscow TEKHNIKA V SEL'SKOM KHOZYAYSTVE in Russian No 7, Jul 80 pp 12-15

[Article by E.V. Zhalnin, candidate of Technical Sciences and A.S. Mnatsakanov, engineer at the All-Union Scientific Research Institute of Agricultural Mechanization: "Harvesting of Grain Crops Under Difficult Conditions"]

[Text] During the past few years, valuable experience has been accumulated in the carrying out of harvest operations on a rapid basis and in a high quality manner. The kolkhozes and sovkhozes are increasing their use of the Ipatovo method for controlling the harvesting-transport complexes. Improvements are being noted in the skills possessed by our machine operators.

However, the harvest work in some regions is being delayed to an excessive degree and this inevitably results in crop losses.

Experience has shown that grain harvesting equipment is being employed most efficiently on those farms where not only is it being prepared for the harvest operations in a timely manner, but in addition it is being adapted for work under those complicated conditions which often arise during the busy harvest season as a result of unfavorable weather.

In combating crop losses, a very great role is played by the periods for commencing the harvest work. The data of scientific studies and the experience of leading farms reveal that it is best to start such work during the middle of the waxy ripeness phase, at which time the accumulation of dry substance in the grain has for the most part been completed. Delays in the commencement of harvest operations lead to irreplaceable losses. Ten days following the optimum periods for carrying out the harvest work, the losses caused by shattering in winter grains and barley amount to 10-12 percent and in the case of oats -- 20-25 percent.

Harvesting of Lodged and Damp Grain Crops

Lodged grain crops must be harvested using only specially prepared units and, in the majority of instances, using the two-stage harvesting method.

The timely mowing of such grain crops is a decisive condition for combating crop losses. Delayed harvesting causes the crops to become contaminated by weeds and this complicates to an even greater degree the harvest work and the gleaning and threshing of the windrows.

Such tracts should be broken up into plots, the long sides of which must not coincide with the direction of lodging. The best mowing results are achieved when the unit moves at an angle of 45 degrees to the lodging. For this purpose, the tract is divided up into two triangles, each of which is harvested separately. This eliminates unproductive runs by the units, runs which are inevitable in the case of four-sided plots, where one side coincides with the direction of lodging.

Following appropriate preparation, the mowing can be carried out using ZhVN-6, ZhShN-6 or ZhNS-6-12 harvesters. The cutting of badly lodged grain crops should ideally be carried out using ZhRB-4.2 harvesters attached to SK-5 or SKD-5 combines. For this purpose the eccentric reels should be re-equipped according to the method employed by the Altay machine operators (see Figure 1). One hundred and five additional pins, each 470 mm in length, are prepared for the reel out of spring steel 5-6 mm in diameter. The billet for a pin is bent for a radius of 145 mm and one of its ends, 80 mm in length, is deflected to the side at a right angle. Thereafter, in the tubes of the rakes and at a right angle to the principal pins, two openings are drilled for each additional pin. One of them is located exactly mid-way between the principal pins, while the other is positioned at a distance of 40 mm. The additional pins are secured by means of cotter pins. Owing to the great offset relative to the tubes, such pins move very well into the lodged bulk, moving it towards the cutting unit.

It should be remembered that the eccentric reels, including re-equipped ones, operate well only when they have been properly installed and adjusted.

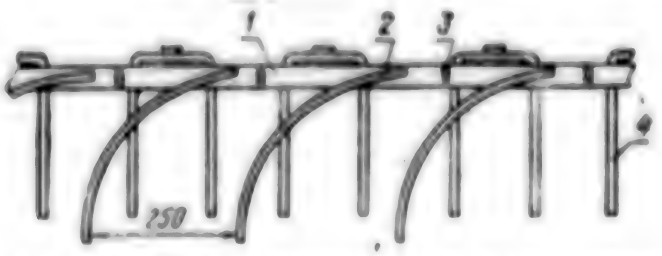

Figure 1. Diagram for installation of additional pins

Key:
1. Tube
2, 4. Additional and principal pins
3. Cotter pin

The shaft of the reel and the tubes of its rakes must be straight, all concavity must be thoroughly eliminated and the pins must be in the same plane and of the same length. During assembly, all of the cranks are installed at the same angle and in the same plane as that of the pins. No free play is permitted in the areas where they are secured.

Special importance is attached to ensuring that the inclination of the pins is properly adjusted. They must be inclined backwards by 15-20°. Depending upon the degree of lodging of the grain crops and the length of the stalks, this angle changes within the mentioned limits.

The best raising and cutting of lodged stalks is achieved when the reel is offset forward of the line of the blade by 200-350 mm. The stalks are seized well by the pins when the distance between their ends and the ground is 10 mm. They must not interfere with the bar. In order to prevent them from reaching the cutting unit, spacer bushings are installed on the coupling rods of the hydraulic cylinders used for raising the reel when changing the height of the reel.

When harvesting badly lodged grain crops and when a considerable portion of the ears are lower than the stalk cutting height, the reel operates best when stalk lifters are installed on the cutting unit of the harvester. There are many designs for such lifters and yet the most reliable ones are those used for pulse crop harvesters. Stalk lifters can be employed only on fields having a smooth microrelief.

Proper mowing requires that the plants be cut at the lowest possible height and that the cutting unit be capable of penetrating well a lodged and entangled bulk of stalks. These requirements are met rather well by a non-pin cutting unit consisting of two segmental blades, one of which is securely fastened to the reaper platform while the other operates on a reciprocal motion basis. The installation of such a unit is rather simple; all of the work associated with producing and installing it is carried out by a combine operator and his assistant in just 1-2 working days.

Grain bulk torpedo dividers having adjustable stalk extractors, instead of the share points used in harvesting normal grain crops, must necessarily be installed on the reapers.

In the case of direct combining operations, lodged grain crops as a rule must be harvested during the dry period of the day. When the grain bulk has a raised moisture content, they should ideally be used on non-lodged tracts. The mowing should be carried out at a low cutting and at an angle to the lodging. If it is not done in this manner, the screw conveyer of the reaper may frequently become clogged by uncut grain bulk. If the grain has lodged in various directions, the combine should be operated in a circular pattern. If uncut tracts remain following such a method of movement, they should be harvested a second time with the combine moving in the opposite direction. For the harvesting of difficult tracts, workers should be assigned for carrying out manual mowing work.

In order to improve the seizing and lifting of the lodged stalks by the rakes, the wooden bats of the eccentric reel are removed. Reels equipped with additional fingers are used only for harvesting lodged tracts, since in the case of erect or drooping stands of grain such reels can result in grain

losses. The opening on the bracket of the eccentric is brought into line with the second opening of the slide bar so as to prevent the sickle-shaped fingers from striking the tension members or entering the cutting unit.

The frequency of rotation of the reel merits special attention, since a raised frequency causes chipping of the ears and pulling out of the uncut stalks.

On lodged grain tracts the concave, screen, sieve and keys of the straw shaker should be cleaned frequently, since they become sticky very quickly and this increases losses sharply.

When harvesting damp and lodged grain crops, special attention should be given to the cleanliness of the surface of the screw conveyor and to the clearance between its spirals and the bottom of the harvester. The presence of projecting edges, indentations on the coils of the screw conveyer, overhanging bolts and welding beads, similar to a small clearance between the spirals and the bottom of the harvester, promote a coiling up of the grain bulk and this in turn leads to greater idle time for the unit.

The moisture content of grain bulk changes throughout the daytime period. Thus a combine must be adjusted for harvesting dry bulk during the period from 1100 to 1700 hours and for the period from 1700 to 2100 hours -- for harvesting damp bulk.

A combine operator experiences special difficulties when adjusting his machine for harvesting long-stalk grain crops of a raised moisture content. Under such conditions and in order to reduce grain losses, it is recommended that use be made mainly of twin-drum combines. The quality of the threshing work is dependent upon the frequency of rotation of the drums and the clearances in the reel unit. The best results are achieved by changing the frequency of rotation of the drums. The establishment of clearances of less than 4-5 mm at the output, for the purpose of reducing the degree of under-milling, often leads to clogging of the reel unit. As a rule, the idle time of combines as a result of clogging of the working organs often derives from incorrect selection of the operating regime and, in particular, the speed of movement for the combine. In such instances, the combines should be operated with a high degree of caution and with every attempt being made to avoid overloading the threshing machine with plant bulk. The optimum feed rate for such bulk for a Niva SK-5 combine is 3.6-4.0 kilograms per second, for a Sibiryak SKD-5 -- 3.8-4 and for a Kolos SK-6P -- 4-6 kilograms per second. The combine's speed should be selected based upon the permissible feed rate.

Caked and damp windrows dry out very slowly. In order to accelerate the drying process, they should be turned over and placed on dry stubble using special implements.

During unstable weather, soil possesses a high moisture content and a low density. Under such conditions, a deterioration occurs in the quality of

the work performed by harvesters, since the profiling shoes become sticky. The shoes are covered with caprone in order to prevent the soil from sticking to them. Towards this end, a wooden form similar to the working surface of a shoe is produced. Thereafter a caprone sheet is cut to the width of a shoe but longer than it by 150-200 mm. It is then heated to an elastic consistency and placed in the wooden form. The shoe is placed in it and pressed down. The ends of the sheet are folded over the forward and rear portions of the shoe. Following cooling and for the purpose of ensuring greater reliability, the sheet is secured by four bolts.

Harvesting of High Yield Grain Crops

When harvesting high yield grain crops, special importance is attached to the working organs of a combine being correctly adjusted. In the case of direct combining of erect grain crops having a normal stall height, the cutting is carried out at a height of 20-25 cm above the ground. A further increase in the height of the cutting may cause an increase in losses during the harvest work. The quality of the threshing is determined by inspecting the ears taken from various areas of a rick. If only one unthreshed grain remains for 15-20 ears processed, the threshing is considered to be satisfactory.

The windscreen cleaning units are adjusted by changing the amount of air supplied by the blower, the degree of opening of the sieve jalousies, the angle of inclination and installation height of the lower sieve and also the angle of inclination and degree of opening of the jalousie of an extension of the upper sieve.

In order to adjust the cleaning units, the maximum frequency of rotation of the blower blades is established initially and the jalousie of the upper sieve is opened to one half its full amount. The extension piece for the sieve is installed in its middle position. If a large quantity of impurities enters the grain hopper, the jalousie is closed until such time as clean grain is produced. If grain becomes mixed with the chaff, the amount of air being supplied by the blower is reduced.

If losses of loose grain are observed or if a portion of the ears is not completely threshed, the inclination of the sieve extension piece is increased and the jalousie opened still further.

If the amount of bulk being supplied to the cleaning unit becomes excessive (this applies in particular to combines having twin-drum threshing units), the grain separation conditions become more complicated. In such instances, even a maximum frequency of rotation for the blower blades may prove to be insufficient for separating the grain from the straw particles. The jalousie of the upper sieve will have to be opened further. But then a considerable portion of the straw impurities may reach the lower sieve and, as a result, it will become clogged and normal operation of the cleaning unit will be disrupted. The sieves should be cleaned periodically in order to prevent this from happening. In order to obtain more pure grain, the jalousies of the second sieve must be closed to such an extent that grain does not reach

the grain screw conveyer. Even with such adjustments, many small straw impurities will inevitably reach it. In order to reduce grain losses, the screen of the grain screw conveyer should be set in the upper position. If following these adjustments the grain still mixes with the chaff and straw, then the adjustment process must be started over again commencing with the threshing unit.

The jalousies are closed when very little grain bulk is supplied to the cleaning unit. Blower adjustments commence when the baffles are opened to a maximum degree. When the cleaning unit is properly adjusted, all of the grain must be separated out roughly 10-15 cm prior to the end of the first sieve. In such cases there is no need for adjusting the extension piece of the sieve. Control is exercised over the correctness of the adjustments based upon the manner in which the grain moves from the sieve to the grain screw conveyer and also according to the purity of the hopper grain. If grain is found in the tailings from the second sieve and it is clean when delivered to the hopper, the rear end of the sieve is raised. At times this is not done in the belief that overall losses are not affected by a small amount of grain moving from the second sieve to the grain screw conveyer.

This is incorrect. Grain which is delivered to the grain screw conveyer for the drum (or straw shaker) turns out to be above the grain bulk flow and thus sustains greater damage and is not separated out as easily from the thrashed heap since it must pass through its entire thickness. As a result, an increase takes place in the grain losses in the straw.

The grain losses occurring during combine operations can be roughly determined in the following manner. The pedal for opening the stacker is pressed down during movement of the combine for the purpose of discharging a rick of straw. The bottom of the stacker is left open for a certain period of time, placing the cuttings of straw and chaff on the stubble for a distance of 10-12 meters. A frame 0.2 square meters in area (500 X 400 mm) is superimposed in several areas on the windrow thus formed and a determination made as to the number of full value grains obtained from the frame area (if underthrashed ears are involved, the grain on them is also taken into account).

The position of the straw discharge screen of the stacker relative to the keys of the straw-shaken and the fingers of the rakes of the straw-baler is adjusted in a manner such that during operation the ends of the keys pass above the inclined portion of the screen with a clearance of 10-15 mm. The ends of the fingers of the rakes of the straw-baler must pass a distance of 5-10 mm from the screen. Work carried out in the absence of a screen results in considerable grain losses, owing to a disruption in the air regime and the formation of loose ricks.

Harvesting of Undersized Grain Crops

Undersized and weedless grain crops as a rule are harvested by means of direct combining, since short-stalk bulk that is placed in windrows does not

endure very well on stubble and the task of picking it up is accompanied by great losses behind the pick-up attachment.

The work should be carried out at a speed of 1.1-1.4 meters per second. An increase in this speed leads to a sharp increase in losses. For the purpose of removing cut stalks from the cutting unit and delivering them to the transporting organs of the harvester, rubberized belts 150 mm in width are fastened on the reel bats.

Many machine operators employ a reel of reduced diameter for harvesting undersized grain crops. This makes it possible to reduce the size of the dead zone and to improve the quality of the cleaning carried out by the cutting unit. This can also be achieved by changing the profile of the bottom of the harvester or through the installation of a duplicating reel. The Niva and Kolos combine harvesters have profiled bottoms and, as a result, the mown bulk is constantly under the influence of the working organs: initially the reel and subsequently the screw conveyer.

The frequency of rotation of the reel is selected such that the peripheral speed of its bats exceeds the forward speed of the combine by 1.5-1.7 times. The rakes are installed with an inclination of 15° forward or vertically. In terms of height, the blades must penetrate a stand of grain by no more than one third of the length of the mown stalks.

The cutting unit is set for a low cutting. The Niva and Kolos combines can provide a cutting height of 5 cm with no re-equipping required.

Two rubberized belts are fastened by means of bolts to the screw conveyer of the harvester, in the inter-finger space. A minimal clearance, but no less than 6 mm, is established between its fingers and the harvester platform. In order to prevent the reel from ejecting cut stalks through the wind guard, it is raised by 400-600 mm.

Grain that is contaminated by weeds must be harvested using the two-stage method, providing there is certainty that the windrow will not collapse through the stubble. During the mowing operation, the harvester must advance crosswise to the direction of the sown rows or at a certain angle to them. In such instances the windrow will droop over the stubble, dry out and be picked up.

In the case of low cropping power, where the weight of a windrow is no more than 1.5 kilograms per meter of its length, it should be combined. This is best accomplished through the use of ZhNS-6-1.2 harvesters, employed for forming the combined windrow. In the absence of such combines, they can be combined using ZhVN-6 harvesters. In such instances, two units are operated on the same plot; they move in opposite directions (see Figure 2). The harvester which lays down the second (upper) windrow moves over the field in a clockwise direction and joins in the work after the first harvester lays down its windrow. They pass in opposite directions on the headlands. In

order to protect the windrow formed by the first harvester, a screen made out of sheet steel 1.5-2 mm thick (see Figure 3) is installed on the cutting unit of the second harvester, in the zone of the discharge window.

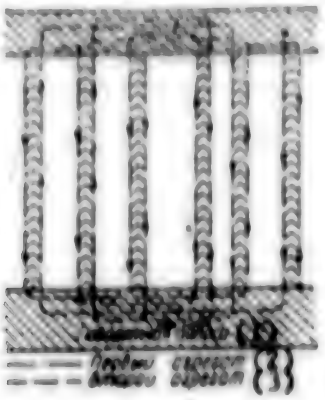

Figure 2. Diagram for movement of ZhVN-6 harvesters during combining of windrows.

Key:

1. Turning strip
2. First unit
3. Second unit

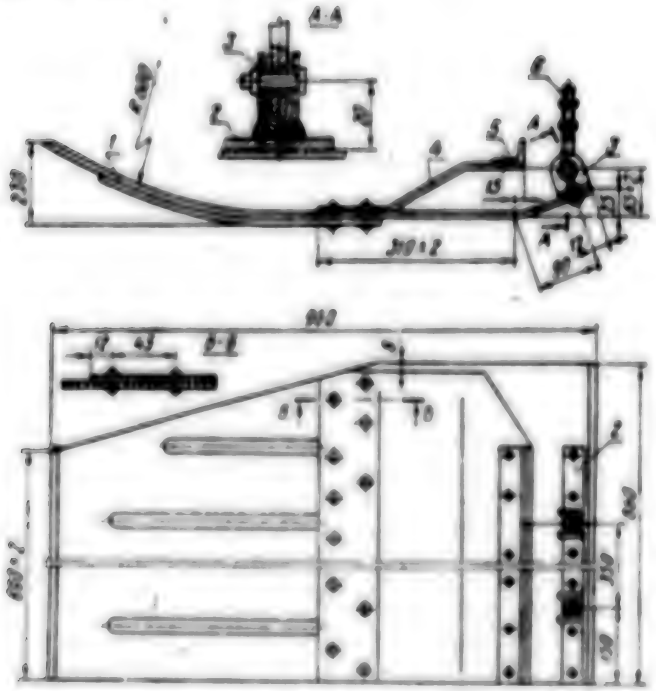

Figure 3. Attachment for ZhVN-6 harvester for combining windrows.

Key:

1. Screen
2. Strip
3. Bracket
4. Baffle plate
5. Angle bracket
6. Special bolt

A steel strip 2 (Figure 3), 630 mm in length, is fastened to the curved portion of the screen. Two brackets are made and openings drilled in them for a finger. One bracket is welded to the strip at a distance of 150 mm from the edge and the second at a distance of 350 mm from the first. Special bolts 6 are inserted in them and secured by the fingers. A baffle plate with an angle bracket is welded to the screen, it is mounted on the finger bar, the bolts are led in through the slot in the vertical shelf of the angle bracket and thereafter the screen and the baffle plate are tightened. A harvester which has a sliding screen can cut stalks lower than if it does not have one. Moreover, the combine operator operates it in a manner such that the window is located above the first windrow.

Use can be made of ZhVN-6-12 and ZhNS-6-12 harvesters, but the windrows cut down by them must be placed one after another rather than side by side. In the process, their wind guards should be increased by 400-600 mm.

The windrows are best picked up using PPT-3 and PTP-2.4 transporter pick-up attachments. Here losses are reduced by 2-3 times compared to drum pick-up attachments. If during the operation of their rakes a certain amount of bulk remains uncollected on the ground, or if it is buried in the ground, the pick-up mechanism should be adjusted in terms of height.

In order to prevent stalks from being rejected, a bar 10 mm in diameter is fastened to the upper shaft of the pick-up attachment at a distance of 50-70 mm from the roller. Its purpose is to promote better cleaning of the fingers.

In order to reduce losses in the form of uncollected stalks behind drum type pick-up attachments, the latter are equipped with a device developed at VNIPTIMESKh [All-Russian Scientific Research Planning and Technological Institute for the Electrification and Mechanization of Agriculture] -- a stationary rake grid consisting of spring-actuated fingers (see Figure 4),

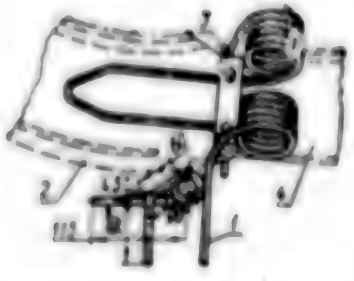

Figure 4. Stationary spring-actuated fingers for a pick-up attachment.
Key:
1. Finger
2. Ring-slope
3. Cover plate
4. Bracket

which can be used as specially curved spare rakes of pick-up attachments. Each individual section of spring-actuated fingers is installed inside the

ring-slope on a bracket and fastened with the aid of a cover plate and two M6X25 bolts. A section of fixed fingers is not installed under the ring-slope which covers the central support of the shaft for the mobile rakes, since the cross piece will brush against the spring. If low windrows are to be picked up, then fixed fingers are not installed on the three or four extreme brackets on both sides of the pick-up attachment. Once the fingers have been installed, the ring-slopes are placed in their former positions. Towards this end, their lower portion is fastened by nuts with spring-actuated washers, on the projecting ends of the M6 bolts. The upper portion of the ring-slopes is fastened in the usual manner.

Regardless of the grain harvesting method employed, the straw must be removed from the fields as rapidly as possible in order to make them available for the carrying out of autumn plowing and other agrotechnical measures in behalf of the following year's harvest. The toothless drag pushing harrow attachments for the K-700 and T-150 tractors, which are being produced on many farms, are making it possible to lower straw losses considerably and to reduce the contamination of straw by dirt.

One such model of a toothless drag harrow was created at VNIPTIMESKh. It is used in conjunction with a K-700 tractor. It is based upon the use of a strong girder welded from No 20 channel iron. During a 24 hour period, this toothless drag harrow is capable of harvesting straw from an area of 150-200 hectares.

7026
CSO: 1824

HISTORICAL DEVELOPMENT OF TRACTOR, AGRICULTURAL MACHINE BUILDING REVIEWED

Moscow TEKHNIKA V SEL'SKOM KHOZYAYSTVE in Russian No 7, Jul 80 pp 6-8

[Article by M.S. Sidel'nikov, USSR Ministry of Tractor and Agricultural Machine Building: "Path for Industrialization of Agricultural Production"]

[Text] The historical development of domestic tractor and agricultural machine building serves as a bright example of consistent and steady realization of Lenin's ideas concerning industrialization of the rural areas, the conversion of agricultural labor into a type of industrial labor and, on this basis, the elimination of contrasts between cities and the rural areas.

As early as 1919, during the 1st All-Russian Congress of Land Departments, Poverty Committees and Communes, V.I. Lenin stated that our obligation and responsibility consists of employing our engineering forces in a manner such that "...the most backward production effort, farming and agricultural, is operated on a new basis, with farming being transformed from a profession that is operated in an instinctive and antiquated manner into one that is based upon science and engineering achievements.

Only the simplest types of agricultural implements were produced during the period of Czarist Russia. According to the 1910 census, there were 7.8 million sokhas, 2.2 million wooden plows and 4.2 million iron plows in use in agriculture.

The planned development of machine building commenced following the October Revolution. On 1 April 1921, V.I. Lenin signed the decree on "Agricultural Machine Building," thus proclaiming it to be a matter of extreme state importance.

The principal statutes of the decree -- determining the collection of machines required in conformity with the country's soil-climatic zones and organizing their mass production based upon the use of specialization -- continue to retain their importance today. Tractor and agricultural machine building has become a large branch of the national economy, having

within its structure 18 tractor and motor production associations, 42 plants and associations for the production of agricultural machines and 46 plants for the production of parts, units and assemblies.

The leaders in Soviet tractor construction appeared in 1923. On 1 May 1924, the first tractor moved across Red Square during a parade demonstration.

The party piously carried out Lenin's precepts and the young Soviet industry developed at an ever increasing tempo. The production of "Fordzon-Putilovets" tractors was organized in 1924 at the Krasnyy Putilovets Plant and 600 such tractors were produced during 1925.

Tractor construction developed as a specialized branch of mass machine building in 1930, at which time the Stalingrad Tractor Plant was built. It was during this year that the first STZ-1 tractor was assembled on its large conveyer line. In 1932 the plant exceeded its planned capability. On 12 April 1934 the one hundred thousandth tractor rolled off the conveyer line, on 14 April 1970 -- the millionth and in 1976 -- the one and a half millionth.

The increasing agricultural requirements raised the need for constructing new plants. In 1931 the Khar'kov Tractor Plant entered operations and in 1933 -- the Chelyabinsk Tractor Plant.

Lenin's dream regarding 100,000 tractors for the peasantry had been realized.

The production of agricultural machines was begun at the Rostsel'mash, Tashsel'mash and other plants, with the overall characteristics of these machines being altered radically. Agriculture was supplied with tractor plows, cultivators, sowing machines and other machines. In 1930 the Kommunar Plant began producing grain harvesting combines and in 1932 the Ryazsel'mash Plant commenced the production of potato harvesting machines. During this same year, Rostsel'mash called for the production of S-1 grain harvesting combines. According to the annual production of combines, our country had achieved first place throughout the world by 1937: 44,000 compared to only 29,000 in the U.S.A.

By 1935 the level of mechanization of agricultural plowing work in behalf of spring crops had reached 40.1 percent and winter crops -- 58.7 percent, for the sowing of spring crops -- 16.7 percent, sowing of winter crops -- 20.4 percent and for the harvesting of grain crops -- 22 percent of the overall volume.

The two pre-war five-year plans for developing the national economy were successfully fulfilled. During these years the branch increased the number of machine designs produced from 67 in 1928 to 119 in 1941. Over a period of 10 years (from 1931 to 1940), the plants produced 685,000 wheel-type and caterpillar tractors.

Tractor and agricultural machine building sustained great losses during the Great Patriotic War. The large Stalingrad and Khar'kov tractor plants, Rostsel'mash and others were destroyed. The nomenclature of machines decreased sharply and overall machine production fell 17 percent compared to 1940.

Even during these very difficult years, the party and government attached tremendous importance to the further development of tractor and agricultural machine building. The Altay, Vladimir and Lipetsk tractor plants were built and placed in operation during the 1942-1944 period and in 1945 the Stalingrad and Khar'kov plants once again began turning out tractors. During the 1959-1960 period, the Khar'kov Tractor Assembly Plant and the Minsk, Onega and Uzbek (Tashkent) tractor plants entered operations and the Southern Machine Building Plant also began producing tractors. As a result, tractor production reached 239,000 units by 1960, that is, it had increased by more than twofold during a 10 year period (only 117,000 units were produced in 1950).

During the first 5 post-war years alone, the production of agricultural machines increased by a factor of 1.2 compared to the pre-war five-year plans. At the same time, their nomenclature was expanded and this made it possible to achieve greater mechanization of operations in the various branches of agriculture, while taking into account the country's zonal conditions.

In 1965, the first "System of Machines for the Complex Mechanization of Agricultural Production" was approved. It was developed by Soviet scientists and designers based upon leading foreign and domestic experience and international scientific achievements. This list of interrelated power engineering resources (tractors, motor vehicles and self-propelled machines) and their associated machines and implements, used for the mechanized carrying out of an entire complex of operations associated with the growing, harvesting and post-harvest processing of various agricultural crops, became the foundation for the creation of agricultural equipment during the 1966-1970 period.

The March (1965) Plenum of the CC CPSU defined the program for further developing agriculture and it outlined the direction to be taken for achieving a sharp increase in the production of reliable and highly productive equipment -- the foundation for the technical retooling of the country's agriculture and for converting it over to an industrial basis.

During the years which have elapsed since the March Plenum, modernization and expansion work have been carried out at the Khar'kov, Volgograd, Minsk and Chelyabinsk tractor construction associations, at Rostsel'mash, at the Taganrog and Krasnoyarsk combine plants and at many others. New plants have entered operations: Ternopol' plant for the production of beet harvesting combines, Pavlodar Tractor Plant, Frolovo Steel Casting Plant, Khar'kov Tractor Engine Plant and others.

During the 1966-1970 period, the branch mastered the production of 321 types of new machines, including the T-130, T-150K, MTZ-80 and MTZ-82 tractors, the Niva and Kolos grain harvesting combines, six-row self-propelled beet harvesting complexes and the KhN-3.6 four-row cotton harvesting machines. All of them have higher productivities and greater economic effectiveness.

During the years of the Ninth Five-Year Plan alone, agriculture was supplied with 1.7 million tractors and 15.8 billion rubles worth of agricultural machines, including 449,000 grain harvesting, 67,000 beet harvesting, 43,000 potato harvesting and 44,000 corn harvesting combines. This made it possible to complete the mechanization of the cultivation of grains, beets and a number of other crops and to reduce to a minimum the time required to carry out the agrotechnical measures.

More than 560,000 tractors are being produced throughout the country annually and this exceeds the tractor production volume for the U.S.A., the FRG, England and France taken together. In terms of overall capability, the country also occupies first place throughout the world. In 1975 the average power rating for one tractor in agriculture was 65.3 horsepower.

The carrying out of the 1976-1980 program for developing tractor and agricultural machine building will make it possible to increase the pool of tractors to 2.7 million, the pool of grain harvesting combines -- to 800,000, to have more than 230,000 beet, potato and corn harvesting machines and to increase the number of cotton harvesting machines to 53,000. Compared to 1975, the production volume for tractors will increase this year by 33 percent (according to overall capability), grain harvesting combines -- by 28, beet and potato harvesting combines -- by 27, cotton harvesting machines -- by 45, plows -- by 26, sowing machines -- by 39 and cultivators -- by 28 percent.

The production of a self-propelled twin-drum grain harvesting combine, plows for use on rocky soil, harrows, cultivators, machines for applying fertilizers and other items of equipment has been developed and is being mastered for the country's non-chernozem zone. The cultivation and harvesting of melon crops, vegetables, common hops, onion sets and others are being mechanized. Of 19 complexes, the development of all machines has already been completed for five, including for the cultivation and harvesting of grain crops, rice and groat crops.

New tractor models have been created during the last years of the Tenth Five-Year Plan possessing high power ratings, a broad range of operating speeds, a high level of reliability and improved working conditions. In addition, the following items of equipment were also created: PTK-9-35, PLN-4-35, PN-4-40 and PGP-7-40 plows, the multi-purpose SUPN-8 pneumatic sowing machine, ON-400-3 and OP-1600 sprayers, SKM-3, KKU-2A-4 and KST-1.4-2 machines for the growing and harvesting of potatoes in beds, KhVN-1.2 and KhVB-1.8 cotton harvesting machines, RKS-4 beet harvesting machines, KSKU-6

six-row self-propelled corn harvesting combine, ZhVR-10 harvester, SKOD-6 rice harvesting combine and KA-3.6 multiple unit having active working organs for the pre-sowing cultivation of heavy textured soils.

The new modernized machines are more productive and less metal-intensive. For example, the productivity of the new plows is 20 percent higher and amounts to 2.9 hectares per hour and that of the wide-cut KPSh-9 cultivator-sweep -- 45 percent higher.

At the present time, the combine builders are implementing improvements in and raising the power ratings of their machines. Special importance is being attached to increasing the production of self-propelled and tow-type harvesters and machines for gathering in the non-grain portion of a harvest.

A considerable increase is expected in the production of multiple unit assemblies, capable of carrying out several technological operations during just one pass. The RUM-8 machine for applying mineral fertilizers and lime to the soil has entered production. It has a load carrying capability of 10 tons and it will used in conjunction with the powerful T-150K tractors.

The level of machine automation has been raised. All of the grain and mineral fertilizer distributors are equipped with a device for controlling the operation of the sowing units and in the pneumatic units -- control over the seed level in the hoppers is automated. The systems for automatic operation of the root harvesting machines make it possible to raise their productivity by 10-15 percent and to decrease crop losses by 10 percent.

A unit for providing automatic protection for plows on rocky soils serves to raise their productivity by 20 percent and the follow-up systems on the implements used for inter-shrub tilling of the soil eliminate the need for manual labor in carrying out these operations. High quality materials and rational design solutions are employed in the new machines for the purpose of lowering the specific metal intensiveness. The use of polymer materials has increased by almost twofold, especially in machines used for applying fertilizers and for the chemical protection of plants.

During the Tenth Five-Year Plan, considerable resources were invested in the construction of new plants and the modernization of existing ones. The branch's largest new construction project is the Cheboksar plant for the production of the T-330 and T-500 industrial tractors, for use in conjunction with bulldozers, rippers, scrapers and other highway construction machines. Special capabilities are being created for the production of hydraulic equipment and automatic systems for agricultural machines.

In the July (1978) Plenum of the CPSU Central Committee and in the decree of the CPSU Central Committee and the USSR Council of Ministers entitled "Measures for the Further Development of Complex Mechanization of Agricultural Production and for Supplying Agriculture With Highly Productive

Equipment," our branch was assigned the very important task of ensuring the complete satisfaction of the agricultural requirements for high quality equipment.

For the purpose of carrying out this task, our branch is following a very clear course aimed at raising the technical level of the tractors and agricultural machines being produced and creating complete groupings of general purpose machines and complexes of specialized machines for use in the growing, harvesting and post-harvest processing of the more important agricultural crops.

As a result, the cultivation and harvesting of grain crops, rice, sugar beets, cotton, sunflowers, corn, potatoes and flax will become completely mechanized during the next few years; the level of mechanization for potatoes will be raised to 85 percent, cabbage and carrots -- to 80 percent and tomatoes -- to 40 percent.

During the final year of the Tenth Five-Year Plan, the USSR Ministry of Tractor and Agricultural Machine Building is devoting special attention to the implementation of the production plans for tractors and agricultural machines and to raising the quality of the products being produced. Measures are being undertaken aimed at achieving greater production concentration, introducing complex technological processes and introducing the use of automatic equipment to the maximum possible degree.

In commemoration of the 110th anniversary of V.I. Lenin's birth, a socialist competition aimed at fulfilling and over-fulfilling the plans and socialist obligations for the final year of the five-year plan has been launched at our enterprises on an extensive scale and with renewed force.

7026
CSO: 1824

WAYS TO INCREASE MILK PRODUCTION IN KAZAKHSTAN DISCUSSED

Alma-Ata SOTSIALISTIK QAZAQSTAN in Kazakh 2 Aug 80 p 2

[Article by N. Sheripbayev, senior scientist, Kazakh Veterinary Scientific Research Institute: "Capabilities To Increase Milk Production

[Text] The July 1978 CPSU Central Committee Plenum stated the task of producing an abundance of meat and milk in this country. In connection with this, at the present time we must find and implement possibilities of increasing milk production in this republic. There are 54 dairy complexes and 120 mechanized dairy cattle livestock units in Kazakhstan. In addition to the above, there are 72 specialized interkolkhoz livestock units in operation, raising heifer calves to replenish and enlarge dairy herds in order to boost production. Thus we have plenty of capability to produce an abundance of milk. In this area the entire question rests on the situation as regards raising dairy cattle, consolidating dairy cattle operations, and employing industrial methods of production. Therefore it is imperative to move ahead without delay in order to accomplish fruitful work in this area.

In this country attention has been focused for quite some time on achieving growth and development of livestock raising on an industrial basis. Experience amassed since then has indicated the following: substantial stocks of feed and forage must be established at the very outset in order for dairy complexes to operate at full capacity and to achieve high performance figures. Secondly, it is necessary to add stock and increase the herd, ensuring that the complex is not operating far below capacity. For this it is necessary to raise heifer calves in an appropriate manner in specialized livestock units. This is one of the reasons for the decree issued at the 13th Plenum of the Central Committee of the Communist Party of Kazakhstan entitled "Extensively Organize Raising of Heifers Produced From High-Productivity Cows in Specialized Livestock Units and Farms, Persistently Adopt the Shop Structure in Raising Dairy Cattle."

At the present time livestock units specializing in raising heifer calves have been organized and are operating in Severo-Kazakhstanskaya, Kokchetavskaya, Tselinogradskaya and other oblasts. These livestock units purchase 10-15-day old calves from farms in the area and put them in

special quarters. Here they are cared for until they are 22-24 months old, at which time they are transferred to the complex. For example, in the last five years 6,000 heifers have been raised by the specialized livestock unit on the Kuybyshev Sovkhoz in Severo-Kazakhstanskaya Oblast and turned over to the rayon's dairy complex. The Novoishim and Zhuravlevskiy sovkhozes in Tselinogradskaya Oblast, the Rozdol'nyy Sovkhoz in Kokchetavskaya Oblast, and the Chistov Sovkhoz in Severo-Kazakhstanskaya Oblast are also doing a good job with their heifer-raising specialized livestock units.

There are very few such specialized livestock units in our republic, however. As a consequence of this, many dairy complexes are not operating at full capacity. Precisely this situation, for example, is encountered in the southern and eastern oblasts.

It is necessary to learn from the experience of other republics. We might note that dairy complexes in Moskovskaya Oblast are well supplied with dairy cows and are doing a good job. A total of 93 percent of first-calf heifers in this oblast are raised by specialized livestock units. Stock which has reached maturity is immediately transferred to dairy complexes. Thus, production does not stop. So these dairy complexes are able to perform effectively and profitably. The conditions for the dairy complexes in our republic must also be brought to this level. To achieve this, it is essential to ensure that dairy complexes are working at full capacity and that livestock units working with first-calf heifers are developing surely and smoothly.

How are these efforts faring? In the specialized livestock units in Tselinogradskaya Oblast, an intensive mode of care is employed with calves up to the age of 6 months: every day each calf is given whole milk, skim milk, hay, silage, and other nutritious forage and feed. Calving facilities have been improved, and a silage and hay supplement is employed to ensure proper growth. In livestock units handling heifer calves, capability is also secured to protect stock from disease. A livestock unit should of course make sure that the animals it accepts are healthy and free of communicable disease. When animals are received, one should look into and verify their breed, state of health, and productivity. Animals brought to the livestock unit are first placed in a specially provided quarantine pen. This pen is thoroughly disinfected, and sanitary requirements are rigorously observed. During the period of quarantine the calves' state of health is determined, and it is strictly forbidden to move the stock from one location to another. Before first-calf heifers are transferred to a dairy complex, they are inoculated against communicable diseases. Livestock units raising heifers are especially important for stocking our republic's dairy complexes. If there is no possibility of organizing interfarm livestock units of this type in a rayon, such units should be established within large milk-producing sovkhozes. For this one should renovate all livestock pens and structures. There are several such operations in Kaskelenskiy Rayon, Alma-Atinskaya Oblast.

Consequently, the rayon's dairy complexes are operating at full capacity and are not standing idle for lack of new dairy stock. The dairy herd is even increasing in numbers.

Pursuant to the decisions of the July 1978 CPSU Central Committee Plenum, in order to boost milk production in this republic, it is necessary to ensure that dairy complexes operate at full capacity and that there is an increase in the total number of dairy cattle. This is the first task. The second task is to eliminate bovine communicable diseases and to reduce herd losses. At the present time, at many dairy complexes the number of cows not fit for milking ranges between 20 and 25 percent. At some, however, the number runs as high as 30-40 percent, due to failure to employ proper veterinary procedures and practices. To reduce herd losses, it is essential to determine the cause of disease occurrence and to eliminate the cause in a prompt manner.

A very good job is being done as regards vigorous execution of the operating mechanism of livestock raising, but some difficulties still exist. For example, cases of udder infection are frequently encountered in connection with the large-scale employment of mechanized milking equipment. This is a result of suppuration-causing microbes invading the udder. Preventing mastitis requires proper utilization and handling of mechanized milking equipment and maintaining cleanliness during milking operations. Contagious mastitis causes great damage to a dairy operation. An infected cow produces less milk, and the composition of the milk changes. To prevent mastitis, the disease should be identified and treated in a prompt manner.

Another problem we should mention which is matter of concern to dairy complexes and livestock units raising heifer calves is injury to hooves, with subsequent infection, by frequent utilization at dairy complexes of steel grillwork floor decking. This rough steel flooring catches the hooves, causing injury to the foot. This offers a microbe point of entry and results in an outbreak of an epizootic disease. To prevent injury to cows' hooves, Moskovskaya Oblast dairy complexes are beginning to replace steel floor decking with plastic. We should do the same. Farms in Alma-Atinskaya Oblast are beginning to replace wooden flooring with rubber in their dairy operations. This flooring is both strong and durable. In comparison with wooden flooring, rubber is easier to clean and requires less labor. Both are equally warm.

If cows are not fed a proper diet, their metabolism suffers, and the number of cull animals increases. To prevent this, a blood specimen should be taken once each month from 10-15 cows and examined in the laboratory to determine quantity of protein, sugar, calcium, and phosphoric acid.

The above recommendations are very important for getting operations running properly at dairy complexes and heifer-raising livestock units and for boosting production. Farm managers and specialists should utilize this experience and know-how, while taking specific local conditions into consideration.

3024
CSO: 1810

TILLING AND CROPPING TECHNOLOGY

TEST THRESHING IN THE UKRAINE

Kiev PRAVDA UKRAINY in Russian 24 Jul 80 p 3

[Article by V. Strel'chuk, senior scientific associate at the Ukrainian NII for Agricultural Economics and Organization imeni A.G. Shlikhter]

> [Text] Recommendations are being made to conduct test threshings prior to the start of harvesting. I would like to know why they will be conducted and how this will affect the wages of machine operators involved in the harvest. --
> --N. Dyachenko, combine operator, Kirovogradskiy Rayon, Kirovogradskaya Oblast', the kolkhoz "Ukraina."

Practical experience indicates that, due to poor regulation of combines and reapers by their controlling agencies and disregard for optimal operational time-tables for harvesting units, grain losses could well total two to three quintals per hectare. Recommendations now in effect in the republic regarding the payment of wages on kolkhozes call for incentives to be paid to machine operators for reducing grain losses at harvesting. Test threshings will serve as a basis for determining the reference level for grain harvesting yields.

For the purpose of determining harvesting yields through the use of test threshing, the kolkhoz administration, in cooperation with professional organizations, establishes within each brigade a commission composed of an agronomist, a brigade foreman, an accountant, a member of the audit board, national inspectors, and the most experienced combine operators. After a proper briefing, test threshing is carried out, following which an official report is drawn up which serves as a basis for determining the amount of additional payments for achieving the reference harvesting yield established by the tests.

Tractor drivers/machine operators(combine operators) who thresh no less per hectare than the reference amount established by test threshing receive, in addition to their base pay, these supplemental amounts based on the total number of quintals of grain harvested from each hectare: for harvest yields of grain and leguminous crops up to 25 quintals per hectare--50 copecks,

from 30.1 to 35 quintals--51-60 copecks, from 35.1 to 40 quintals--61-70 copecks, from 40.1 to 45 quintals--71-80 copecks, from 45.1 to 50 quintals--81 copecks-1 ruble, above 50 quintals--from 1 ruble 01 copeck to 1 ruble 10 copecks.

Tractor driver/machine operator assistants working on combines receive an amount equal to 70 percent of the total additional wages paid to tractor drivers/machine operators(combine operators). During double shift operations, relief combine operators are paid according to the same requirements used for regular operators. The additional wages are drawn from funds allocated for incentive payments.

Along with economic incentives, considerable importance in the reduction of harvesting losses can be assigned to economic responsibility as well. By decision of the kolkhoz management, these sanctions may be applied against machine operators who do not come up to the required standard for harvest yields:

--A combine operator whose grain yield per hectare totals one quintal less than the reference test level will not receive the aforementioned additional payment;

--for a grain yield deficiency of up to two quintals per hectare, the harvesting work will be counted as a partial loss and the combine operator and his assistant will be entitled to only 75 percent of their base pay;

--for a grain yield deficiency in excess of two quintals, the work will be counted as a total loss and no wages will be paid.

[illegible]

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UDC 631.81.095.337

MAGNESIUM FERTILIZERS IN THE UDMURT ASSR

Sverdlovsk URAL'SKIYE NIVY in Russian No 6, Jun 80 pp 37-38

[Article by A. Beznosov, director of the Udmurt research and design station for chemical applications, candidate of agricultural sciences; Yu. Semenov, group director]

[Text] With high rates of intensification in crop production, and despite adequate supplies of nitrogen, phosphorus, and potassium, it is possible for plants to develop the need for other nutrients which, when they are lacking, limit prospects for obtaining a high-quality harvest and reduce the effectiveness of fertilizer applications. One such nutrient is magnesium. It is well established that some crops extract more than 30 kg of magnesium from each hectare at harvest and that a dry-weight content of less than 0.12 percent of this element in plant tissues indicates the need for the application of magnesium to the soil.

Considerable depletion of soil magnesium occurs with the application of mineral fertilizers due to the resulting acceleration of leaching out that follows. Liming of soils also decreases the availability of magnesium to plants because it alters the relationship of calcium and magnesium.

In a series of experiments carried out in various zones of the country, magnesium fertilizers produced a beneficial effect on harvest yields of agricultural crops, as well as on their quality. Also brought to light was the fact that feed crops raised under magnesium deficiency were of relatively poor nutritive value.

Magnesium deficiency is most dramatically revealed in the poor moisture retention characteristics of sandy and sandy-loam soils. In the Udmurt ASSR, 23 percent of soils having light texture are found on crop lands. A sample agrochemical survey showed that the magnesium content in sandy-loam soils of the republic averaged 3[illegible] mg/kg, light-clays--49, and medium- and heavy-clays--51 mg/kg of soil (reference OST [All-Union Standard] 46-49-76).

In order to examine problems in the use of magnesium fertilizers under conditions prevailing [illegible] Udmurt ASSR during 1973-1977, we carried out two

series of experiments with winter rye and potatoes on lightly-cultivated sod-podzolic sandy-loam soils in the Zav'yalovskiy and Yak-Bod'inskiy rayons.

The experimental plots contained soil having a naturally low level of fertility. The content of exchange magnesium varied between 26-74 mg per kg of soil in the winter rye experiment, and between 19-31 mg/kg for potatoes.

Mineral fertilizers and lime in half-rate dosages determined by the hydrolytic acidity of the soils were applied during field preparation prior to sowing. Powdered limestone containing 78-93 percent calcium carbonate was used in the experiments and pure magnesium sulphate containing 16 percent magnesium oxide. Results of the five experiments demonstrate that the application of mineral fertilizers, $N_{60}P_{60}P_{60}$, provides for additional harvested yields of winter rye totaling 4.1-4.6 quintals/hectare. At the same time, liming does not show a noticeable effect on either the harvested yield of winter rye or the efficacy of mineral fertilizers.

The application of magnesium brought about a limited increase in the harvested yield of winter rye, and, in doses of 40 kg of MgO, provided an added yield of 10 percent for both referents(for referent fertilizer applications both with and without $CaCO_3$). The calcareous fertilizers were not observed to have a definite influence on magnesium effectiveness.

The mineral fertilizers also displayed great effectiveness in the potato experiments. Liming produced no significant effects.

The application of magnesium was accompanied by a substantial increase in harvested yields of potatoes, and a MgO treatment of 50 kg/ha yielded an additional 51 quintals of tubers per hectare. Including lime in the referent fertilizer application produced a limited reduction in magnesium efficiency, which quite possibly results from the increase in the ratio of Ca ions to Mg ions(see table).

The effect of calcareous and magnesium fertilizers on harvested yield of potatoes in quintals per hectare

Models	Harvested Yield
Control, no fertilizers	118
$N_{80}P_{80}P_{80}$ --referent	169
Referent + $CaCO_3$ 0.5 dose	174
Referent + MgO_{30}	189
Referent + MgO_{50}	220
Referent + $CaCO_3$ + MgO_{50}	209

Thus, the data of the agrochemical investigation, as well as the experiments conducted demonstrate that, when combined with the application of average dosages of NPP mineral fertilizers and lime, magnesium fertilizers have considerable promise for use on the light sod-podzolic soils of the Udmurt ASSR. Magnesium fertilizers should be applied to potato crops at the rate of up to 50 kg of magnesium oxide per hectare, and to winter rye, up to 40 kg/ha. In order to reduce magnesium requirements, it would be advisable to apply dolomitic limestone powder to light soils.

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BRIEFS

HIGH-PROTEIN WHEAT--Khar'kov--Quality testing has been completed in the oblast' on high-grade and nutritionally valuable strains of wheat gathered under special supervision. Approximate analysis, conducted on-site in the field, indicated that the several hundred thousand hectares involved were producing grain with a higher protein and gluten content. Foliar feeding of the plants, which provides in the time remaining before harvesting an appreciable improvement in the grain's baking characteristics, will be carried out according to agrotechnical specifications. Grains of outstanding quality are coming to ripeness in the fields of the oblast'. Farmers are estimating yields of no less than 40 quintals of high-grade, nutritionally valuable strains of wheat from each hectare of arable land. [Text] [Moscow IZVESTIYA in Russian 2 Jul 80 p 1] 9481

MORE WHEAT-QUALITY CHECKS--Khar'kov--Diagnostic testing of the quality of high-grade and nutritionally valuable strains of wheat has concluded on all croplands of the oblast'. Approximate analysis, conducted on-site in the field, indicated that the several hundred thousand hectares involved were producing grain with a higher protein and gluten content. These grains were gathered under special supervision. For the first time, accomplishment of the objective with regard to the production of nutritionally valuable and high-grade grain will be taken into consideration in totaling the results of the socialist competition between rayons. The harvesting plan has already been worked out down to the smallest detail. To prevent intermixing of the high-grade strains with more common varieties, specific areas for their processing have been set aside in the threshing rooms and separate storehouses and transport facilities have been arranged for. [Text] [Kiev PRAVDA UKRAINY in Russian 8 Jul 80 p 2] 9481

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